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Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

No. 144

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AUSTRALIA

JABILUKA URANIUM MINE OK'D AMID ONGOING CONTROVERSY

Federal Approval

Brisbane THE COURIER-MAIL in English 17 Mar 82 p 22

[Text] CANBERRA. — The Federal Government yesterday approved development of Australia's biggest uranium mine, Jabiluka, in the Northern Territory.

But supply contracts would not be given the go ahead until an agreement between the Northern Land Council, representing Aboriginals, and the project venturers was finalised.

The joint partners, Pancontinental Mining Ltd and Getty Oil Development Co. Ltd, have been negotiating with the NLC for the last 13 months with the aim of working out an acceptable deal for development.

The two parties signed an agreement on February 27 following endorsement of the mining plan by the traditional land owners.

Mr Anthony said supply contracts could be entered into once the agreement with Aboriginals was approved by the Aboriginal Affairs Minister, Senator Baume.

Mr Anthony said approval had to be conditional because the mine was on land that would eventually be controlled by an Aboriginal land trust.

The project, which is expected to cost more than $600 million, was within the boundaries of the proposed second stage of the huge Kakadu National Park.

But in line with government policy, the mine would be excluded from the park once it went ahead.

ALP Opposition

Canberra THE AUSTRALIAN in English 18 Mar 82 p 2

[Article by Laura Veltman]

[Text] THE Minister for Trade and Resources, Mr Anthony had obviously succumbed to pressure from Pancontinental Mining Ltd and Getty Oil Development company in giving conditional approval for the Jabiluka uranium project to proceed, the ALP claimed yesterday.

Labor's spokesman on conservation and the environment, Mr Stewart West, said the two companies were concerned a contracting world uranium market could cause them to miss out on maximum sales, thus placing their $600 million investment in the Northern Territory at risk.

"The Jabiluka partners are proceeding at their own risk in the full knowledge that Labor policy is for a moratorium on uranium exports," Mr West warned.

On Tuesday, Mr Anthony announced conditional approval for the development of the Jabiluka project.

Mr West said the Northern Territory Government could not be trusted to adequately protect the environment of Kakadu National Park, which bordered the proposed uranium mining site.

The project area should be incorporated into Kakadu National Park.

"The continued listing of the park on the World Heritage List could now be placed in jeopardy by this huge uranium mine," Mr West said.

The conditional approval to the Jabiluka partners was granted on the basis of increased Australian equity in the project by 10 per cent and the agreement of traditional Aboriginal owners, represented by the Northern Land Council.

CSO: 5100/7525

BRIEFS

NUCLEAR-FREE PACIFIC ACTION--The ACTU and trade unions in other Pacific countries will consider introducing trade bans in protest against nuclear activity in the Pacific region. A meeting of the Australian and New Zealand Trade Union Co-ordinating Council, in Melbourne yesterday, discussed plans to step up the campaign for a nuclear-free Pacific. It was decided that further representations should be made to the French Government to condemn French tests at Mururoa Atoll. The president of the ACTU, Mr Cliff Dolan, said it was possible that action be taken to disrupt the import and export of French goods. [Text] [Melbourne THE AGE in English 16 Mar 82 p 18]

ATOMIC WORKERS' VULNERABILITY--Canberra.--A Queenslander had been refused a life insurance policy because he had worked at one of the government's atomic test bases, Federal Parliament was told yesterday. Senator Keeffe (ALP, Qld) said an insurance company would not give the man a policy on the grounds that his life expectancy was shortened through working at Maralinga, South Australia. The government leader in the Senate, Senator Carrick, said he had not heard of such a case, "but that was not to say it had not happened." He said he would ask the National Energy and Development Department to investigate the claims. He also urged all former employees of government testing bases to contact his department as part of a study into the effects of working at the atomic stations. Senator Carrick said his department already had located records belonging to 10,000 former employees. Another 5000 still had to be found. Senator Keeffe said an air force doctor had told the man to leave Maralinga for health reasons after being there for less than a year. [Text] [Brisbane THE COURIER-MAIL in English 17 Mar 82 p 10]

CSO: 5100/7525

BRIEFS

VIENNA CONFERENCE PLANS--Bangladesh has been invited to participate in the international conference on Nuclear Power Experience to be held in Vienna in September this year, says a Press release. The conference will be organised by the International Atomic Energy Agency (IAEA), a UN organisation for promotion of nuclear power for peaceful purpose. ENA adds: The aim of the coming IAEA conference is to give indepth review of problems faced in implementation and operation of nuclear power projects, reliability cost economics and safety aspects of nuclear power lessons learnt from the experience gained and their implications for the future. About 225 papers will be presented in the conference by outstanding scientists and engineers from 37 countries including Bangladesh. [Text] [Dacca THE BANGLADESH OBSERVER in English 15 Apr 82 p 3]

CSO: 5100/7083

BRIEFS

FRENCH N-TEST PLEDGE--Paris, Fri: The Prime Minister of Fiji, Sin Kamisese Mara, says he has been assured by the French President, Mr Mitterrand, that everything will be done to end nuclear tests in the Pacific. Sir Kamisese told reporters that Mr Mitterrand had given him the assurance in recent talks on Pacific affairs and other issues. The Prime Minister, on his first visit to France, also said that Mr Mitterrand outlined the reforms that his Government was undertaking in the French Pacific territory of New Caledonia.--AAP-Reuters. [Text] [Perth THE WEST AUSTRALIAN in English 13 Mar 82 p 2]

CSO: 5100/7524

REAGAN POLICY SAID TO BODE ILL FOR TARAPUR PACT

Madras THE HINDU in English 7 Apr 82 p 1

[Article by G. K. Reddy]

[Text] NEW DELHI, April 6.

The Reagan Administration is inclined to relent a little and supply some of the critical spare parts required for the Tarapur atomic power plant without prejudice to its stand on the fuel question, according to the latest reports from Washington.

The U.S. Embassy in Delhi has been strongly urging the administration to keep the two issues separate and not let the continued disagreement on fuel replenishment come in the way of supply of spares for routine maintenance of the plant.

A decision is expected shortly granting the necessary export permits for the shipment of the minimum spare parts required for running the Tarapur power station with the requisite margin of safety as recommended by Westinghouse, which had built the plant. Though there is no imminent danger of a mishap as a result of some defective components or faulty instrumentation, it is necessary to replace the malfunctioning parts to adhere to the prescribed safety standards and maintenance requirements.

Deadlock continues: But on the main issue of fuel supply the deadlock continues with neither India nor the U.S. making any fresh move to reopen the issue with some new suggestions. As India is not in any great hurry to revoke the agreement the U.S. apparently sees no harm in keeping the whole thing in abeyance until such time that the two sides are ready to talk again.

Meanwhile, the Government is getting ready for performance review, by the IMF before the release of the next instalment of the loan. The Indian Director on the IMF Board, Mr. M. Narasimham, will be arriving from Washington for policy discussions with the Government on the subject.

It remains to be seen what stand the U.S. representative is going to adopt during this review: whether he will pose some embarrassing questions which might compel India to forego the rest of the IMF loan. In either case, it will be indicative of the Reagan Administration's evolving attitude towards India, whether there will be a further hardening on its part or greater flexibility in dealing with it.

The new strains that have developed in Sino-American relations over U.S. arms supplies to Taiwan is indicative of the Reagan Administration's rigid approach to various global problems, including the question of rearming Pakistan. If this mood continues to prevail in Washington, it will be very difficult to evolve any compromise over the Tarapur problem. The mere supply of a few critical spares is not going to make much difference to the main controversy over the legalities of the U.S. refusal to continue to comply with its contractual obligations.

The fact that India has gone as far as it could in the present circumstances, consistent with its own nuclear policy, in holding out the promise privately that it has no intention of going in for another test in the near future, has not met with a matching response from the U.S. side. The Reagan Administration continues to evade in one way or the other its responsibility to keep up the flow of fuel supplies, even though it is no longer insisting on fullscope safeguards on the entire field of nuclear activity in India as an essential pre-condition.

The current deadlock in the Indo-American nuclear dialogue relates primarily to the safeguards involved in an orderly termination of the Tarapur agreement. Despite the unilateral repudiation of its contractual obligations, the U.S. has been insisting that India should retain the safeguards in a mutually agreeable form on both the plant and the spent fuel so that the plutonium derived from reprocessing cannot be used for any purpose, peaceful or non-peaceful, without the prior consent of Washington.

CSO: 5100/7078

BHABHA DIRECTOR OPENS SYMPOSIUM ON NUCLEAR COMPONENTS

Bombay THE TIMES OF INDIA in English 9 Apr 82 p 6

[Text] BOMBAY, April 8.

NUCLEAR energy is the greatest gift of nature and science. Indian scientists shall do everything to exploit it with indigenous technology while there is still some time to do so, according to Dr. Raja Ramanna, director of the Bhabha Atomic Research Centre here.

Inaugurating the two-day national symposium on "Manufacture of nuclear components" under the auspices of the Board of Research in Nuclear Sciences, Dr. Ramanna said that nuclear power in India was coming out of a period of adolescence and the difficulties faced by it resembled that period in actual life.

If the Indian manufacturing companies progressed at the same pace as they did in the past 15 years, very soon India would be in a position to manufacture all equipment and components needed for our nuclear industry, he felt. When the Indian nuclear programme became a little larger, various indigenous manufacturers, fabricating nuclear components, would set apart an exclusive shop for such components, Dr. Ramanna added.

However, India still depended on foreign manufactureres for some components, essential for the power reactors, he said.

RESEARCH REACTOR

While all the major components for unit I of the Rajasthan Atomic Power Project were imported, for the second unit of the Narora Atomic Power Project, all of them were being made in India, Dr. Ramanna said. Most of the components and equipment for the research reactor R-5 at Trombay and for the Fast Breeder Test Reactor at the Reactor Research Centre, Madras, were made in India.

In his keynote address, Dr. Srinivasan said delays of three or four years had been experienced in the delivery of major nuclear equipment and the inability to miantain delivery schedules was the main problem with the industry both in the public and the private sector. Technical problems arising during the course of manufacture and the developmental nature of the job involving a learning process, mainly led to the delays in the delivery of the equipment, he added.

CSO: 5100/7081

INDIA

ATOMIC POWER UNIT STILL AWAITS COMMISSIONING

Bombay THE TIMES OF INDIA in English 16 Apr 82 p 7

[Article by K. Sharma]

[Text]

NEW DELHI, April 15.

WHAT does it cost the nation if a Rs. 100-crore project remains uncommissioned more than a year after the unit has been completed?

This is what has happened to the Madras Atomic Power Project (MAPP-I). The department of atomic energy said at the beginning of last year that 99 per cent of the work on the project had been completed. The situation remains unchanged in April this year.

The problem is of the availability of heavy water. A similar situation had earlier delayed the commissioning of the second unit of the Rajasthan atomic power project till a decision was taken to use the Soviet heavy water.

The department now maintains that it will be able to commission the Madras unit during this year, but there is no information as to where the necessary heavy water will come from. According to reliable sources, the indigenous production is still inadequate and certainly not enough to meet the huge initial requirements for commissioning a new unit.

It may not be difficult to procure heavy water from foreign sources, but then the government will have to decide in favour of placing the Madras unit under international safeguards. The USSR also insists on international safeguards if its nuclear supplies are used in any facility.

Some experts have also suggested that since one of the units of Rajasthan plant will remain closed for long for major maintenance, its heavy water could be temporarily loaned to the Madras unit for initial charging. This can be done if the domestic availability of heavy water is expected to go up in the next few months.

The heavy water production programme has been affected badly because of lack of proper planning and also because of difficulties of self-reliant development. The heavy water plant at Tuticorin and Baroda operated during 1981-82, but both were ridden with technical problems. Remedial steps are being taken.

The heavy water plant at Talcher was to have started production in 1981-82. This did not happen due to power failure, unsteady supply of synthesis gas from the Fertiliser Corporation of India and some other technical problems.

The Talcher plant being the first of its type is facing certain operational and mechanical problems. This may take some time to sort out and if no further problems are encountered, production may start by June this year.

The heavy water plant at Kota has been almost completed. Some operations are to be undertaken and it is expected that the plant will be commissioned after June this year.

In the context of the perspective plan for increasing the nuclear power generation from the present 1800 Mw to about 10,000 Mw by the end of the century, an expansion programme for heavy water production has been drawn up. Preparatory work for two heavy water projects has been started.

Financial sanction for the Thal-Vaishet heavy water project has been issued and consultants have been appointed. Fabrication work will be undertaken during the year. With a view to promoting indigenous development, work has already been started on some critical items like compressors and process valves. Development work so far has given enough confidence that such equipment can be produced indigenously.

The department has also prepared the feasibility report for another new heavy water project, work on which will also begin during this year.

CSO: 5100/7082

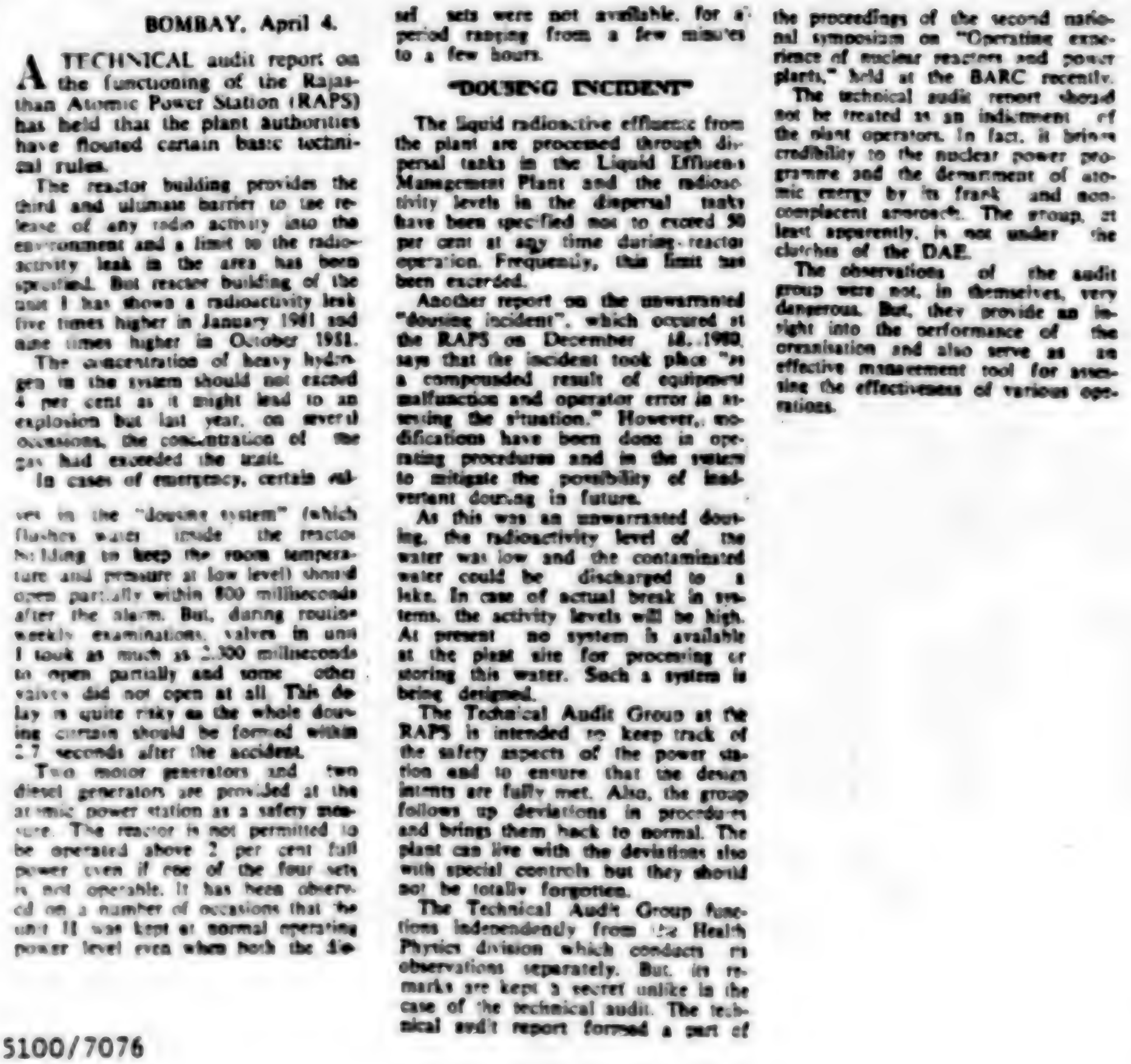
INDIA

REPORT ON RAJASTHAN NUCLEAR PLANT TELLS FAULTS

Bombay THE TIMES OF INDIA in English 5 Apr 82 p 6

[Article by S. Kumar]

[Text]



BOMBAY, April 4.

A TECHNICAL audit report on the functioning of the Rajasthan Atomic Power Station (RAPS) has held that the plant authorities have flouted certain basic technical rules.

The reactor building provides the third and ultimate barrier to the release of any radio activity into the environment and a limit to the radioactivity leak in the area has been specified. But reactor building of the unit I has shown a radioactivity leak five times higher in January 1981 and nine times higher in October 1981.

The concentration of heavy hydrogen in the system should not exceed 4 per cent as it might lead to an explosion but last year, on several occasions, the concentration of the gas had exceeded the limit.

In cases of emergency, certain valves in the "dousing system" (which flushes water inside the reactor building to keep the room temperature and pressure at low level) should open partially within 800 milliseconds after the alarm. But, during routine weekly examinations, valves in unit I took as much as 2,300 milliseconds to open partially and some other valves did not open at all. This delay is quite risky as the whole dousing curtain should be formed within 2.7 seconds after the accident.

Two motor generators and two diesel generators are provided at the atomic power station as a safety measure. The reactor is not permitted to be operated above 2 per cent full power even if one of the four sets is not operable. It has been observed on a number of occasions that the unit II was kept at normal operating power level even when both the diesel sets were not available, for a period ranging from a few minutes to a few hours.

"DOUSING INCIDENT"

The liquid radioactive effluents from the plant are processed through dispersal tanks in the Liquid Effluent Management Plant and the radioactivity levels in the dispersal tanks have been specified not to exceed 50 per cent at any time during reactor operation. Frequently, this limit has been exceeded.

Another report on the unwarranted "dousing incident", which occured at the RAPS on December 18, 1980, says that the incident took place "as a compounded result of equipment malfunction and operator error in assessing the situation." However, modifications have been done in operating procedures and in the system to mitigate the possibility of inadvertant dousing in future.

As this was an unwarranted dousing, the radioactivity level of the water was low and the contaminated water could be discharged to a lake. In case of actual break in systems, the activity levels will be high. At present no system is available at the plant site for processing or storing this water. Such a system is being designed.

The Technical Audit Group at the RAPS is intended to keep track of the safety aspects of the power station and to ensure that the design intents are fully met. Also, the group follows up deviations in procedures and brings them back to normal. The plant can live with the deviations also with special controls but they should not be totally forgotten.

The Technical Audit Group functions independently from the Health Physics division which conducts its observations separately. But, its remarks are kept a secret unlike in the case of the technical audit. The technical audit report formed a part of the proceedings of the second national symposium on "Operating experience of nuclear reactors and power plants," held at the BARC recently.

The technical audit report should not be treated as an indictment of the plant operators. In fact, it brings credibility to the nuclear power programme and the department of atomic energy by its frank and non-complacent approach. The group, at least apparently, is not under the clutches of the DAE.

The observations of the audit group were not, in themselves, very dangerous. But, they provide an insight into the performance of the organisation and also serve as an effective management tool for assessing the effectiveness of various operations.

CSO: 5100/7076

LACK OF SAFETY MEASURES AT NUCLEAR FUEL COMPLEX CRITICIZED

New Delhi INDIA TODAY in English 30 Apr 82 p 59

[Text] SAFETY and security measures at the Nuclear Fuel Complex (NFC) in Hyderabad seem to have hit a new low with two accidents last month. Whether it could have been avoided is debatable but the manner in which two children died after extensive burns in a strange fire on March 6 and how the NFC ushered in the Telugu New Year (March 26) with a bang at the zirconium sponge plant reveals basic safety lessons are still being learnt at the complex—the kingpin of the country's atomic energy programme.

In a negligent act a woman and three children were killed and at least 12 others injured in the blaze of March 24 last year. Flammable zirconium scrap caught fire as the drums containing the material were off-loaded from a lorry by the roadside killing innocent passers-by (INDIA TODAY, April 16-30, 1981). This year the NFC is on safer ground and is not totally responsible for the death of Velu, 9, and Palaniamma, 4, in what remains a mysterious fire at its non-combustible waste dump. Paradoxically, the two children and their mother 35, went there to collect fire wood. Lakshmi recalls: "There was a loud noise and the flames leapt high. The next moment the girl ran and the boy was thrown back after both had been burnt."

The girl died that night and the boy next morning at the Gandhi Hospital. Lakshmi, the lone eyewitness is at a loss to explain how the matter ignited. As illiterate migrant labourers from the Dharamapuri district of Tamil Nadu, Lakshmi and her husband Gopal are so ignorant that they refused to accept the ex-gratia of Rs 500 for the loss of each child offered by the Government presuming it to be a bribe to buy their silence. So when the Hyderabad-East Sub-divisional Magistrate M.B. Ramswamy began the enquiry on March 24 he had to explain repeatedly that questions being asked were only to ascertain facts and not an indictment. Surprisingly the NFC with all its scientific methods for disposal of wastes is also unable to explain the explosion. Argues a senior NFC official, "The fire is a mystery even to us, since the area has not been used as a dump for the past two years." Nevertheless, the lumps of magnesium chloride found in the dump were fresh; two-year-old waste would have leached and been carried away by the rain. Combustible zirconium filings have also been found there by the police who have promptly registered a case of death due to negligence against the NFC. Already five NFC officers are facing similar charges in the March 1981 case.

Investigating: Another telling indicator is a blackened patch on the rocky scrubland that is used as the dump. The flammable material, zirconium or anything else, would have had to have been present in significant quantity to leave that tell-tale sign. In their anxiety to disown responsibility for the fire NFC officials argue that if zirconium had been present as in last year's case, "The burns would have been intensive and of the third degree in which the flesh is virtually cooked." Post-mortem reports show Velu and Palaniamma died of shock following first and second degree burns. Now, it is for the police and the investigators of the Department of Atomic Energy (DAE) to establish the cause of the fire.

The poor response of the NFC staff to the incident is obvious. Syed Ghulam Rasool, an employee of a cycle rickshaw shop, who took the children to the Gandhi Hospital says when he telephoned the NFC from the Hospital on March 6 evening, the person who answered did not believe him. It was only the next morning and, as Rasool says, "perhaps after reading the newspapers", that the NFC began to evince interest. Apparently the NFC security needs tip-offs from outsiders to know what is happening on the 500-acre complex. The incident happened at about 4 p.m. in the peripheral 200 acres that lie beyond the tightly guarded 300-acre "Prohibited" area. Vigil in the peripheral area is poor and the security staff is not sufficiently strong to man the entire complex.

Faulty Furnace: The Telugu New Year explosion in the zirconium sponge plant was due to the lid blowing off one of the four reduction furnaces in which zirconium chloride is treated with magnesium metal to get reactor grade zirconium sponge and magnesium chloride as the by-product. These furnaces, commissioned in 1971, used to be filled from the bottom till 1976 when they were redesigned to enable top loading so as to increase productivity and reduce maintenance time. Each reduction process lasts about 40 hours and although 2,400 processes have been completed, using that furnace the pressure fluctuations are surprising, says a plant source at the zirconium sponge plant. The accident occurred following swift pressure changes which tore the lid off, blasting it right through the asbestos roof.

Now a high level safety review committee is investigating how the furnace failed and the fire deaths occurred and they will recommend steps to be taken to improve safety measures at the NFC. Meanwhile, the peripheral 200-acre open area is being fenced and security men are to patrol its perimeter round the clock. Following the 1981 incident the NFC has double-fenced its waste disposal facilities and is to strengthen it with a two-kilometre wall costing Rs 12 lakh. But once again the obvious preventive – that safety and health measures in the DAE units be enforced by an independent agency – is being conveniently ignored.

AMARNATH K. MENON

CSO: 5000/5732

NUCLEAR FUEL COMPLEX GETS ORDER FROM WEST GERMANY

New Delhi PATRIOT in English 8 Apr 82 p 5

[Text] HYDERABAD, April 7 (UNI)

THE Nuclear Fuel Complex (NFC) here has bagged orders worth over a crore of rupees for supply of zircoloy products to West Germany.

NFC cheif executive N Kondala Rao who had just returned from Bonn told UNI that more orders were in the offing.

He said it was a matter of pride for NTC to supply zircoloy products to West Germany which had hitherto been buying them from France and the USA.

Mr Rao said the first consignment had left on Monday and the rest would be exported shortly.

The zircoloy tubes manufactured in NFC are used as containers for nuclear fuel.

Mr Rao said NFC had also sent samples of high purity material produced in the special material plant to West Germany and Japan. This was used for electronic products, he added.

He said NFC would supply technology for the 10-tonne titanium plant proposed to be set up in the Defence Metal Research Laboratory (DMRL) here to manufacture titanium metal sponge. NFC had developed the required technology in its pilot plant but it had not been put to use.

Mr Rao said titanium was available in plenty in Kerala and ultimately the Kerala Mineral and Metal Corporation would set up a larger titanium plant.

He said the titanium plant at the DMRL might be set up in a couple of years.

CSO: 5100/7080

BRIEFS

PLUTONIUM FUEL PLANS--New Delhi, April 15 (PTI)--The department of atomic energy (DAE) has launched a Rs. 91.2 million project for making plutonium fuel for the second generation nuclear power plants. The DAE annual report for 1981-82 said, "The project envisages the development of Solgel process for making plutonium bearing nuclear fuels for thermal and fast reactors on a pilot plant scale." The atomic reactors operating today use either enriched uranium or natural uranium as full-plutonium is the fuel proposed for the next generation of nuclear plants in the country. The annual report said that the pilot plant making plutonium fuel "is expected to be commissioned by December 1983." Regarding the fuel for Tarapur plant, the report said that the entire stock of enriched uranium imported from the United States "was exhausted in the beginning of September 1981." The DAE said that the Nuclear Fuel Complex in Hyderabad "is at present processing available scrap" to feed Tarapur plant. The report said that the eighth refuelling of the unit-2 of the Tarapur plant would be due in June--an indication that the power plant will be in operation for at least until June 1983. The Tarapur unit has completed 12 years of operation so far. Meanwhile, initial studies on the fifth atomic power project at Kakrapar in Gujarat have begun. The report said that investigations on the foundation condition and procurement of raw materials were in progress. The Kakrapar atomic power project would be commissioned by 1991, the report said. The DAE said that 90 percent of the work on the fast-breeder test reactor in Kalpakkam had been completed. It will be completed by the end of 1983. The report said that more heavy water plants were to be set up in the current plan period starting with one at Thal Vaishet. Another heavy water plant proposed will be similar to the Kota heavy water plant of Indian design. The plant would have a capacity of 200 tonnes, the report said. [Text] [Bombay THE TIMES OF INDIA in English 16 Apr 82 p 1]

JANATA LEADER FAVORS 'GOING NUCLEAR'--Chandigarh, April 6--Janata Party national executive member and a former MP Krishan Kant has advocated that India should go in for nuclear weapons. He has also pleaded that India should welcome Pakistan going nuclear. Talking to newsmen here today, he said when both countries went nuclear, the doctrine of mutual destruction would work as it was working with the super powers. Then no adventurer either in India or in Pakistan would venture on a conflict. Indo-Pak power balance cannot come without that. In his view, going nuclear would help in doing away with the hegemony of super powers. Answering questions, he said where was the question of disarmanent when there was no armament. Armament must come first. Why should we object to Pakistan or other decolonised nations going nuclear? This would be another assertion of their national identities in worldwide advance of backward nations. What I am against is India losing its lead in nuclear technology which she had after Independence. India was ahead of China in the fifties. Now it was behind China by seven to 10 years. Pakistan was racing ahead. Future India will not forgive the past and the present rulers if they let this lead pass out again even in respect of Pakistan, he said. He did not agree that such a compulsion would be against Gandhian principles, it would rather be in tune with them. [Text] [New Delhi PATRIOT in English 7 Apr 82 p 10]

CSO: 5100/7079

PROSPECTS OF EC NUCLEAR FUSION PROGRAM DISCUSSED

Duesseldorf ATOMWIRTSCHAFT-ATOMTECHNIK in German Mar 82 pp 149-153

[Article by Prof Dr K. H. Beckurts, member of the managing board of Siemens AG, Otto-Hahn-Ring 6, 8000 Munich 83: "Nuclear Fusion--A Chance for Europe"]

[Text] Immediately after the establishment of Euratom, the member states decided to group together relevant projects being worked on in their laboratories into a European program for research and development in the area of nuclear fusion. From 1959 on, the EC Commission accepted a key role as coordinator of this program, which today has as participants not only the EC member states but also Sweden and Switzerland. About 1,000 scientists in all are working in this program. The total financing for the overall program within the period 1979/83 comes to 877 million ECU [European Currency Units]. Of this, the host countries are paying 492 million ECU and the Commission is covering 385 ECU. The execution of the program is being done within the framework of association agreements between Euratom and those organizations in member states which are active in the area of fusion, as well as in connection with the joint enterprise JET [Joint European Torus]. Some projects are also being carried out at Ispra.

At the end of 1980, the EC Commission set up an advisory panel (European Fusion Review Panel) with the task of "making assessments of the following, with due regard for international developments in the area of nuclear fusion:

"- the present status of research and development work in the area of fusion within the framework of the Community's fusion program,

"- other developmental prospects for fusion as an energy source for the Community,

"- the future plans for the Community's fusion program, above all with respect to the next major stage,

"and the elaboration of recommendations for the further shaping and executing of the Community's program."

This panel, which was at work in the period from January to June 1981, was made up of ten experts1) from seven countries, under the chairmanship of the author. The panel's report2) was delivered over to the Commission on 6 July 1981. The Commission endorsed the recommendations contained in this report to a large degree. Some of the more important conclusions and recommendations of this panel are summarized in what follows.

1. Nuclear Fusion as an Energy Source for West Europe

In 1980 West Europe consumed about 1 billion tons of crude oil units (t ROeE) of primary energy. Of this, about 55 percent was imported, above all in the form of petroleum and natural gas, for which about 100 billion European Currency Units (ECU) had to be paid out in foreign exchange to other parts of the world, above all to the OPEC countries. In view of a probable further increase in the energy demand and considering the very small European oil and gas deposits, the situation may become even more critical. Thoroughgoing energy-saving measures, an increased use of coal, the continued buildup of fission reactors, and the full utilization of the potential from regenerable energy sources can bring about a change in the next few decades. The technology required for this is available today for the most part, and its application depends above all on political and economic factors as well as on the attitude of the public to the new technologies and their effects on the environment. In this way, Europe can get through the period up to the next century with respect to its energy consumption. But new and almost inexhaustible sources of energy have to be tapped to provide for the time when oil, coal, and uranium become scarce and expensive.

Nuclear fusion has good prospects of becoming one of these almost inexhaustible energy sources. On the basis of the deuterium-tritium reaction--with tritium being produced from lithium, which is found in nature and is widely available in Europe--the accessible energy resources in the world add up to $3 \cdot 10^{12}$ to $3 \cdot 10^{16}$ t of ROeE[3]. On the basis of the deuterium-deuterium reaction, the deuterium content in the oceans corresponds to 10^{20} t of ROeE. Compared to these resources, the present annual world energy consumption amounts to about 10^{10} t ROeE.

But in assessing a new source of energy, other factors must be taken into consideration as well in addition to the availability of fuel reserves. It is asserted now and then that fusion reactors will be safe and clean compared to conventional fission reactors. Neither claim is entirely correct. Although no monitoring system is needed to guard against the danger of a nuclear power excursion, the reacting plasma is held together and isolated from the vessel walls by strong magnetic fields, and the energy stored in these fields is very great. A sudden release of this energy through a malfunction of the coils or through other accidents is a potential danger, above all because of the large inventory of radioactive tritium and the structural materials which have been activated by neutrons. The high neutron flux in the reactor damages the structural materials and impairs their mechanical integrity. In principle, means are known for overcoming these and other potential dangers in connection with fusion reactors.

In contrast to nuclear fission, the reaction products of a fusion reactor are not radioactive. Nevertheless, because of the neutron activation of the reactor structure a problem does exist with respect to the storage of radioactive waste. But the radiotoxicity of the wastes from a fusion reactor is less than that of the wastes from a fission reactor--above all on a long-term basis--since there are no wastes with a long-lived alpha activity.

Consequently, fusion reactors will not be completely safe or completely clean. They involve possible dangers and environmental risks, but in comparison to other significant energy sources they definitely show potential advantages. There even exists the remote possibility of the development of advanced fusion fuel cycles--for example, on a pure deuterium basis--in which the risks due to tritium would be largely eliminated and the induced radioactivity would be reduced.

One must assume that three important developmental stages must be reached before fusion can be adopted on a large scale as an energy source:

- Scientific feasibility--that is, the proof that under laboratory conditions a reacting fusion plasma can be confined for a sufficiently long time and that a positive energy balance can be achieved. Presumably this scientific feasibility will be demonstrated in the 1980's from the large tokamak experiments whose construction is already well advanced (JET in Culham, TFTR [Tokamak Fusion Test Reactor] in Princeton, JT-60 in Tokai Mura).

- Technical feasibility--that is, the proof that the fundamental technical problems of the fusion reactor can be solved. Examples: Tritium handling on a large scale, the behavior of materials under extreme radiation exposure, the remote operation of very complex equipment, and the conversion of fusion energy--which appears predominantly as kinetic neutron energy--into a utilizable form of secondary energy. To demonstrate this technological feasibility is the main goal of several very large and expensive devices which are being considered at present in various parts of the world (NET [Next European Torus] in Europe, FED in the United States, FER in Japan, INTOR as a joint project of the EC, the United States, the USSR, and Japan). Here the hope is that construction will be started on at least one of these facilities by the middle of the 1980's.

- Commercial feasibility--that is, the proof that power plants using fusion reactors can be built and reliably operated on an industrial scale, and that in comparison to other sources of energy they can generate usable energy at competitive prices. Various studies have arrived at widely divergent cost estimates, but although these are higher than costs for conventional nuclear power plants they lie within the same order of magnitude. However, a definitive assessment would be premature at the present time. It is very unlikely that commercial feasibility can be achieved with the generation of devices which will be built subsequent to the demonstration of technical feasibility. It is more likely that at least one intermediate step will be necessary to demonstrate the feasibility of the fusion-reactor power plant.

From the above it follows that the journey toward commercial fusion will be long and expensive and will require the solving of extraordinarily difficult technical problems. In view of the many steps which have to be taken still, it is unlikely that energy from commercial fusion reactors will be in common use within the next 50 years, and by that time expenditures worldwide for research, development, and demonstration devices will probably have grown to over 100 billion ECU.

These problems have been known about for a long time. In addition there is the question of what attitude future societies will have toward this new energy source. Nevertheless, there is worldwide agreement that the potential advantages of harnessing on earth the energy source of the stars are so enormous that they justify this extraordinary effort. The USSR, Japan, and the United States are carrying out ambitious long-range fusion research programs. The American program is the most extensive so far. In 1980 in the United States, a Magnetic Fusion Engineering Act was passed which calls for a considerable expansion in research work. In Japan as well, activities in this field are increasing very fast. Therefore the European advisory panel is of the opinion that Europe must continue to maintain a high status in fusion research.

Fusion cannot be viewed independently of other options for practically inexhaustible energy generation--for example, the employment of the breeder reactor or the extensive use of solar energy. The fast breeder has already been developed up to the commercial stage, but its social and political acceptance is running up against serious difficulties in some European countries. The economic efficiency of the solar energy systems, which are at an early stage of development still, depends on the geographical location, on the climate, and on the required power densities, and all of these conditions appear rather unfavorable for highly industrialized and densely populated Europe. Because of these problems and uncertainties, the only reasonable strategy for the future should lie in not neglecting any of the long-range options for our energy supply, but in following instead all of these paths in parallel and always with the appropriate funds.

Like other industrialized countries, Europe is facing a very serious challenge at present: In the midst of an economic recession, it must engage in a complex and expensive course of action which will manage to reduce our dependence on oil and find substitutes for it among "medium-term" energy sources. But at the same time preparations must be made also for a further transition to practically inexhaustible long-range energy sources, which is to be achieved through expensive research and development programs. In view of the urgent short-range and intermediate-range problems, a look ahead beyond more than 50 years may not seem to be very warrantable. But if Europe does not now continue its development of fusion energy on an adequately broad level, this important energy option will not be available to future generations when it is needed.

2. Status of European Research in the Area of Fusion

In the past decade, the European program has concentrated increasingly on the most promising system--the tokamak. Table 1 shows the most important large European tokamak facilities, and Figure 1 gives a survey of the laboratories which are participating in the nuclear-fusion field.

In this sector, Europe has proved to be fully competitive. In connection with the tokamak system, Europe has been particularly successful in the field of plasma heating. The highest n τ T-product has been achieved at Frascati, and in the coming 10 years JET will be the largest fusion device in the world.

Only about 10 percent of the Community's present activities are directed toward a few carefully selected alternative systems, which in lying within the family of toroidal magnetic confinement systems not only will be alternatives to but also will make contributions to the tokamaks. The work on mirror devices has been completely halted. Less than 2 percent of the current budget is being spent on laser developments and investigations of light-matter interactions.

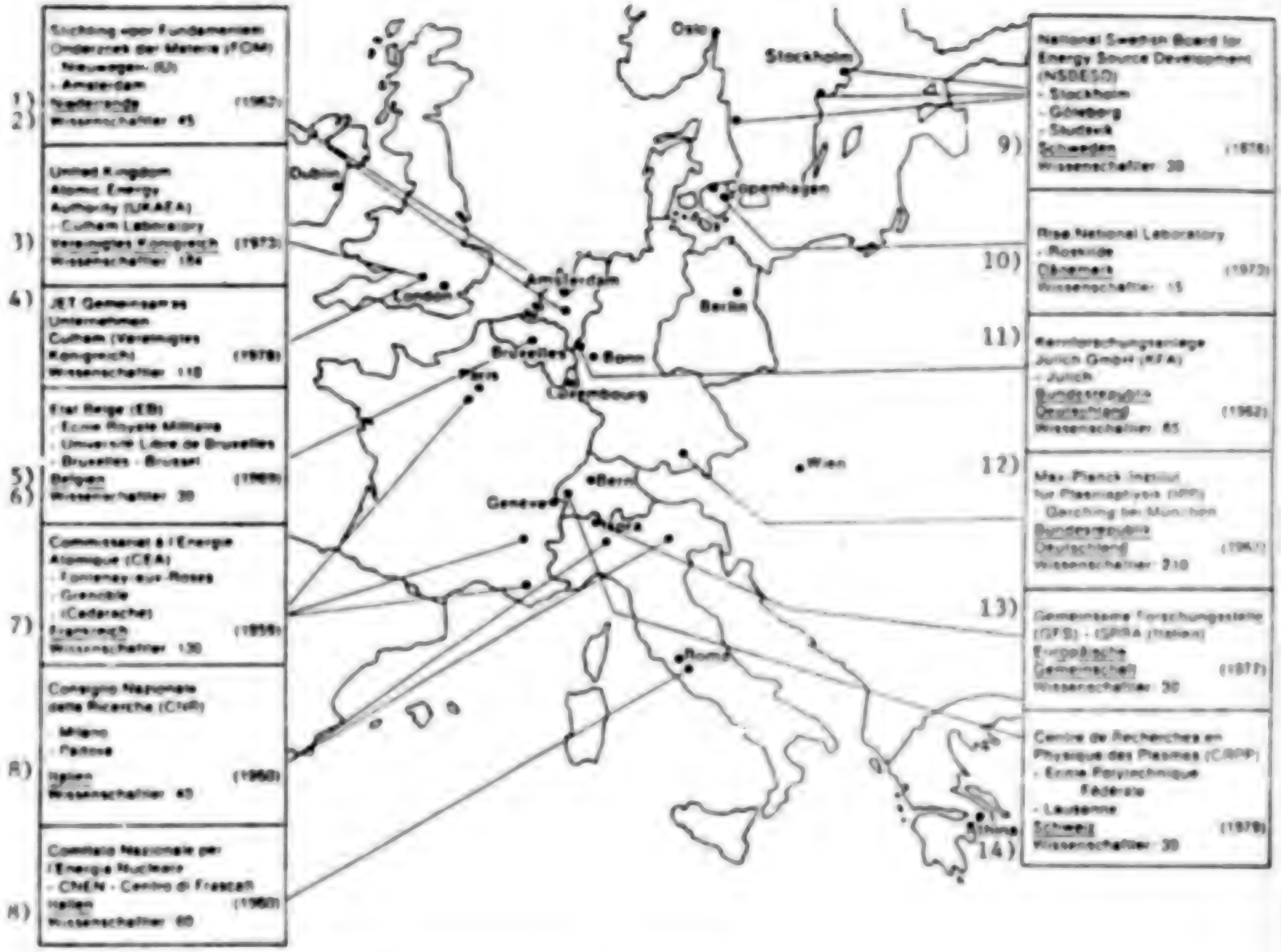


Figure 1: Sites of Fusion Laboratories in Europe

Key:
1. Netherlands
2. Scientists
3. United Kingdom
4. JET joint undertaking
5. Brussels
6. Belgium
7. France
8. Italy
9. Sweden
10. Denmark
11. Juelich Nuclear Research Facility GmbH (KFA), Federal Republic of Germany
12. Max Planck Institute for Plasma Physics (IPP), Garching near Munich
13. Joint Research Center (GFS) - ISPRA (Italy), European Community
14. Switzerland

Table 1: The Most Important Tokamaks in Europe

Initial operation	Apparatus	Present and future primary aims	Plasma current (kA)	Pulse duration (sec.)
1973	TFR (Fontenay)	Plasma heating, physics	400/600	1
1976	DITE (Culham)	Divertor, heating, physics	250/350	0.5
1977	FT [Frascati Torus] (Frascati)	Scaling laws, high-frequency heating	1000	1
1980	ASDEX [Axialsymmetrisches Divertor-Experiment] (Garching)	Divertor, heating, fuel replenishment	500	5
1981	TEXTOR [Torus-Experiment fuer technologisch orientierte Forschung] (Juelich)	Interaction of plasma and wall	500/600	3
1983	JET	Scaling laws, heating, interaction of plasma and wall, alpha particles	3800/4800	5/13

The technological part of the fusion program (about 7 percent of the total budget) is devoted almost entirely to the tokamak, with it being oriented primarily to the requirements of those installations which will come after JET. International cooperation (with non-European countries) has brought some early concrete results in certain areas of technology and in connection with the systems studies (INTOR).

On the whole, the panel makes a favorable assessment of the results of the European program and the success of the Commission's coordination activity. However, it is of the opinion that in consideration of the transition from the more scientific to the technological phase of the fusion-research program, a few shifts in emphasis are advisable, and that in the longer term an organizational streamlining of the program must take place.

In particular, the following notes were made in this connection:

- The comparatively narrow basis of the present European program involves a certain risk, although this is offset in part by international cooperation.

- Even though the plasma-physics aspects of the fusion program are well provided for, there is already a considerable lag in the likewise important fusion-technology program. In particular, not enough attention has been devoted to the systems aspects in connection with operation and maintenance.

- Although in some laboratories there are contacts between fusion research and research and development in the field of nuclear fission, nevertheless these contacts are neither frequent enough nor sufficient in scope.

- The European program is small in the sector of inertial confinement; it does not even allow as yet an adequate evaluation of work being done in other parts of the world.

- In those cases where research under way in smaller laboratories has not yet been integrated into larger programs, the efficiency of this research has decreased in the same measure as the main programs at the larger institutions have increased in size. On the other hand, because of their links with the advanced schools, the small laboratories are providing an effective training for young scientists.

3. Recommendations for the Future Program

The panel is convinced that Europe must remain in the front line of fusion research, and therefore it recommends a steady continuation of the European fusion program. The work being done on proving scientific feasibility must be continued, and new projects for the demonstration of technical feasibility must be begun. The main goals of the program for the coming decades must be the proof of the feasibility of fusion as an energy source and the search for optimal ways to fully utilize its potential.

On the Program Strategy, the panel recommends (Figure 2):

- a further developing of the tokamak system within the framework of a substantial program directed towards a demonstration reactor, and the executing of the initial phase of this program (the JET project along with its development stages) as well as the executing of programs in support of the tokamak confinement system;

- the stepping up of development work on the technology required for the construction of the second stage of the tokamak program (Next European Torus, NET), with this work being oriented toward concept-design studies;

- an investigating of alternative confinement systems applicable to reactors, preferably in cooperation with other fusion programs around the world and above all the program of the United States;

- critically examining, toward the end of the 1980's, the results of the JET and of similar experiments which are being performed elsewhere, and then coming to a decision on whether the construction of the second stage of the tokamak program should be started on.

In parallel with these activities, systems studies for fusion reactors should be carried out in order to continuously evaluate the progress achieved and to make it possible to continue to orient the program toward its final objective, the demonstration reactor (DEMO). As concerns the employment of the funds available in the Community, about 80 percent should be used for the first two parts of the program specified above, and a maximum of 15 percent for the third part.

As for the JET Project, the panel recommends the speedy executing of the first three phases of the JET program, so that JET can reach full power as soon as possible, and furthermore the preparing of JET for D-T operation. A decision to inject tritium into JET will have a very strong effect on the program strategy and should be thoroughly discussed at the proper time. The associated laboratories should be encouraged to participate more extensively in the construction and operation of JET.

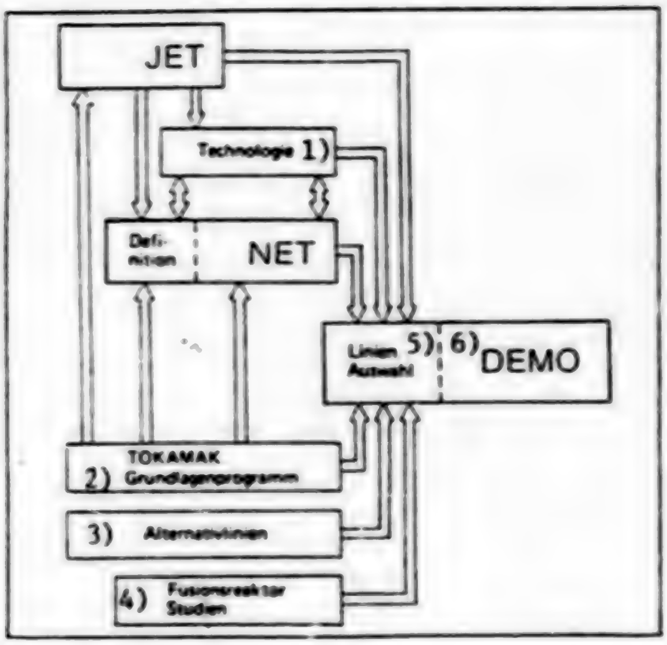


Figure 2: Elements of the Program Strategy

Key:
1. Technology
2. Basic program
3. Alternative systems
4. Fusion-reactor studies
5. Systems selection
6. Demonstration reactor

On NET and the Technology Phase, the panel recommends the following:

- the commencement of a substantial and well-balanced program on fusion technology which is aimed above all at solving technological problems of the NET and in the execution of which the experiences gained in the technology of fission reactors is used. Focal points of such a program should lie in the areas of superconducting coils, tritium handling, remote control, breeding blankets, materials, and safety and environmental aspects.

- the intensification of work on concept designing for an apparatus belonging to the next stage and work on solving the associated problems by means of the establishment of a NET study group;

- the establishment of a steering committee for fusion technology on a high level which can advise the Commission with respect to the activities at the second stage--that is, the NET study group and the technology program.

As for the General Tokamak Program, the panel recommends that the trend be continued toward a concentration of work on newer and larger tokamaks. Three new specialized tokamak projects (Table 2)--which are at different planning stages--

are definitely justified from the point of view of program strategy, and the panel recommends the execution of these projects.

Table 2: New Tokamak Facilities

Facility	Tasks	Planned initial startup
TORE SUPRA (Cadarache)	Superconducting coils - long-pulse physics - heating - investigation of the diffusion of impurities	1986
FTU (Frascati)	Scaling laws (high n), resonance heating in the lower hybrid region	1985
ASDEX UPGRADE (Garching)	Poloidal divertor outside the toroidal field coils - cold plasma jacket - monitoring impurity diffusion - noninductive plasma current	1988

With respect to the Alternative Magnetic Confinement Systems, the panel recommends that Project RFX4) and the two-stage development of the advanced stellarator be carried out. The participation of the United States in both programs is planned. Since the Community is not carrying out any work on mirror machines, it should actively keep track of the extensive mirror program of the United States by sending personnel to observe it and possibly by supplying components or taking on certain tasks.

With respect to Inertial Confinement, the panel recommends that work in this area be continued only to the extent necessary to keep track of the advances achieved in other places, without striving for competitiveness on an international level. To this end, it is essential:

- to attend to certain basic problems in connection with inertial confinement on a small scale, although on a somewhat larger scale than hitherto;

- to effectively coordinate the limited activities within the associations and keep as wide open as possible the chances for cooperation with laboratories within and outside the Community;

- to keep track of the advances achieved in other programs around the world.

At present, the panel does not recommend any development program oriented specifically towards Fusion-fission Hybrid Systems. Instead, these systems should be re-evaluated from time to time within the framework of systems studies.

The panel regards the employment of funds by the Commission at the level of about 1,500 million ECU (1981 prices) for the period 1982 to 1986 as reasonable in view of the necessary expansion of the program, and it recommends to the competent authorities that they approve of this appropriation. The panel places particular emphasis on the need to support JET and on commencing the program of NET technology.

The panel is of the opinion that outlays at this level, which correspond to about 0.6 percent of the current annual total outlays by Europe for research and development and to 0.3 percent of its present annual outlays for fuel and electricity imports, are justified on the grounds of the significance of the long-range potential of fusion for Europe's energy supply, and also because of the scientific value of the program as well as its stimulating effect on European industry. These expenditures are lower than those of the more ambitious program of the United States, and they even lie below--on a per-capita basis--the outlays in connection with the Japanese program. Nevertheless they are probably sufficient to maintain Europe's competitiveness and to put it in a position such that it can negotiate agreements on cooperation and on an exchange of information with the other partners--something which will become more difficult as soon as fusion enters into the technological phase.

Although the NET studies and the technology program could begin on a high level within the framework of the existing Management Structures and with the incorporation of the recommended steering committee for fusion technology, consideration should be seriously given to the alternative of putting the whole fusion program under a single management structure in the future--a system which is geared better to the coming technological phase of the work and to the effecting of major projects.

The panel recommends the further improvement of cooperation among the associated laboratories as well as with JET and NET. Participation in major projects of other laboratories should become a significant component of the programs of all associations, above all the smaller ones. The financial inducement in encouragement of such participation should be increased. Support for JET and for NET technology should enjoy the highest level of priority in the programs of all the associations.

The panel recommends working towards the goal of getting industry involved at an early stage of the NET-technology program. European industrial undertakings should be brought into the NET-technology program as consultants and suppliers for systems project work. Whenever possible, industry should be involved in the planning and development of advanced components. The exchange of personnel between fusion laboratories and industrial firms should be promoted.

The panel endorses strengthened international cooperation with all other fusion programs in the world. In particular, it emphatically recommends that cooperation continue with the United States, the USSR, and Japan on the INTOR project. In the area of alternative confinement systems, cooperation with the American program is of particular importance; this cooperation should be founded on the complementarity of the European and American programs. The already initiated cooperation in the field of fusion technology should be extended to other areas, and above all to the large installations of the next generation--FED, FER, and NET.

The problems of controlled nuclear fusion represent a great challenge for science and engineering. An appropriate solution is doubtlessly possible only within the framework of close European cooperation. But at the same time, the potential of this energy source offers a great chance to Europe.

FOOTNOTES

1) Members of the European Fusion Review Panel: Dr J. B. Adams, CERN [European Organization for Nuclear Research]; Prof C. Bernardini, Rome; C. Bienvenu, EdF [Electricite de France]; J. R. Goens, Eurodif/CEN [Centre d'Etude de l' Energie Nucleaire], Prof H. L. Jordan, DFVLR [German Research and Development Institute for Air and Space Travel]; Sir John Hill, BNFL [British Nuclear Fuels Ltd.]; L. H. Rey, Stockholm; Prof G. Stoppini, Pisa; Prof J. Teillac, CEA [Commissariat a' l' Energie Atomique]; Prof H. G. von Bueren, The Hague/ Utrecht.

2) Report of the European Fusion Review Panel; Brussels: June, 1981, EUR-FU BRU/XII-715/81.

3) The complete utilization of all proved minable resources for both lithium isotopes would yield $3 \cdot 10^{13}$ t of ROeE, but probably only about 10 percent of this is truly accessible. If lithium could be recovered from sea water (0.17 g/t), this figure would increase to $3 \cdot 10^{16}$ t of ROeE.

4) RFX = Reversed Field Pinch; meanwhile, the UKAEA [United Kingdom Atomic Energy Authority] has withdrawn its proposal on setting up this experiment in Culham.

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DEVELOPMENT OF FIRST NUCLEAR HEATING PLANT REPORTED

Warsaw RZECZPOSPOLITA in Polish 31 Mar 82 p 3

[Interview with Prof Jerzy Minczewski, Government Plenipotentiary for Atomic Matters, by Krzysztof Szczesniak; date and place not specified]

> [Text] At its previous session the Sejm enacted a law on the creation of the State Atomic Agency. We turned to Prof Jerzy Minczewski, the Government Plenipotentiary for Atomic Matters, for more detailed data concerning this important legal act and for a discussion of the problems typical for this branch of science and technology.

[Question] Professor Minczewski, couldn't we have gotten along without the existence of the agency, and where did the idea arise to form an agency, and not an office, or a bureau, as has been the usual thing in our country?

[Answer] To tell the truth, I am unable to describe the basis for this very well. This is exclusively a question of legal terminology. All in all, we acted in conformity with the wishes of the community of Polish atomic physicists concerning the establishment of an Office for Atomic Matters. It turned out differently, and probably turned out for the good. Because of this kind of official solution, the representatives of ministries and scientific institutions connected with atomic matters will become part of the board of the agency. What are the advantages coming from that? We will have an influence on the initiation and implementation of technical and scientific concepts, and vice versa, the ministries will be able to adapt the direction of the work of atomic specialists toward their own needs through their own representatives in the agency's board.

[Question] Well good, so please answer me: why does the agency not include within the scope of its activities the problems of the Polish nuclear power industry, which, pursuant to the aforenoted law, remains under the control of the Ministry of Mining and Power Industry?

[Answer] In all countries where there are nuclear power stations, they are subordinate either directly to the concerns that operate them, or to a ministry for power industry matters. In addition to this, there are state institutions of the same type as our agency, that have the right, and not only the right, but even the obligation to supervise and inspect them. They issue licenses for the startup of electric power stations, after having first checked out whether nuclear safety has been assured. That way, there is two-fold supervision: that of the ministry of power industry and the external one--that of the agency. The International Atomic Energy Agency in Vienna recommends such a solution, and we are abiding by it.

[Question] So what has come out of it...? To date, the construction of the nuclear power station in Zarnowiec has not gotten off the ground. I doubt whether the institution of the agency will accelerate the construction.

[Answer] Undoubtedly, a look into the matter of progress of this construction project will have to be one of the duties of the agency. I consider that we, with both our scientific facilities and our status, will help the Ministry of Mining and Power Industry to accomplish these construction projects as well as possible. The adoption by the Council of Ministers of the decree on the construction of the first nuclear unit proves that the country's leadership is convinced that without a nuclear power industry, there is no other way to go, there is no other way to bridge the energy gaps in industry.

[Question] Certainly, won't this gap be filled also by the "atomic law," which the agency is supposed to draw up?

[Answer] Of course, but I do not know whether you know that in Poland, we do not have a unified law that would regulate radiological protection and nuclear safety. There is a whole gamut of scattered legal acts that set standards in part for these questions, as concerns component standardization and checking. In addition to this, we have to work up new solutions in this field. I will say, as an example, that in the light of the current instructions, there are no legal bases for putting a nuclear power station into operation in Poland(?). I hope, that the "atomic law" draft, which is nearly ready now, will still get to the Sejm this year.

[Question] Polish atomics has many achievements to its credit, however, recently, we haven't been hearing much about it. Have we fallen behind relative to other countries?

[Answer] To a large degree, these are only the external manifestations of the existing state of affairs. Although it is true that during the last 10 years there was a lack of money for industrial implementation. Therefore, there are developments that are awaiting producers, and certain installations are being produced in small quantities. However, our scientific facilities worked productively during the entire time, and we did not lose anything in the way of scientific potential. For example, the "Neptun 10P" 10-MeV electron accelerator for tumor treatment, produced in cooperation with the French firm CGR-MeV, has been exported to the GDR and to other countries.

In a year, we will produce: the "Linel 4MX" 4 MeV therapeutic accelerator, which has been already developed completely by us, and can be used in place of cobalt bombs. The Institute of Nuclear Research is in the process of supplying a neutron spectrometer and a diffraction meter to Libya, where an atomic center is being constructed, and we are a supplementary supplier for it. We have put nuclear equipment and installations into series production by the Polon Plant. This production provides for the most vital needs of the country and is an important export item.

We are producing radioactive isotopes for medicine and industry, and the tagged compounds with these isotopes. In addition to this, there are many original developments in the application of nuclear techniques and radiation technology that have been implemented in industry. Under the new conditions of economic reform, we have the hope that we will succeed in acquiring coproducters, without whom, in view of our own weak production capabilities, we are incapable of increasing production. The same is true for export. I will add that our current activity is 90 percent directed toward import replacement.

However, we have stayed behind, are left in the dust, it's true, as far as nuclear power is concerned. Poland is the only socialist country without an atomic power station. What more can we add? And as for a nuclear heating plant? I am convinced that a decision has to be adopted right now in this matter, and the country's first heating plant based on nuclear fuel has to be built parallel with the electric power station in Zarnowiec. All the more so in view of the fact that we can build it and equip it within our own capacity. We have already worked up a conceptual plan for it. Only the fuel would be imported from the USSR. It is simply a pity to continue to waste precious coal for heating.

[Question] That is right. Except for the fact that in our difficult economic situation, these plans appear to me to be destined for some future day?

[Answer] I am fully aware of the economic situation in which we find ourselves today. Please remember, however, that in the field I represent, we are working, not for today, nor for 2-3 years in the future, but with a lead time of 20-30 years. If we neglect today even that backwardness that has accumulated over the years, I do not know if it will be possible to make up for it at all.

I hold before me the bulletin of the International Atomic Energy Agency. According to world data, for every monetary unit of investments carried for the development of nuclear technology, an economic effect of from 3 to 30 times is gained. In our conditions, if thermal-contractile pipes are concerned, this effect is perhaps 1 to 100. Nuclear technology, as can be seen, brings collossal profits. The mission of the State Atomic Agency will also be, among other things, to inculcate this awareness into domestic industry and what comes after this is the setting into action of the scientific potential of Polish atomics, which has been moribund up to now because of a lack of interest.

[Question] Then, we await the beginning of the activity of the agency.

[Answer] I think that that is a question of several days. The executive orders have to appear, a president of the agency has to be appointed, and... then we shall set about our activity.
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BRIEFS

URANIUM PRODUCTION SUPPORTED--The Tunisian chemical company Societe Tunisienne des Industries Chimiques Maghrebines and the French firm Uranium Pechiney Ugine Kuhlmann plan to produce uranium at the Tunisian town of Gabes, it was reported from Paris last week. Construction of the factory will start next year and it is due to begin producing an annual 132 tons of uranium in 1985. The uranium will be separated from waste products through a process involving phosphoric acid, a spokesman for the French company said. [Text] [Paris AN-NAHAR ARAB REPORT & MEMO in English No 15, 12 Apr 82 p 5]

CSO: 5100/5007

SPD REJECTS MORATORIUM ON NEW NUCLEAR POWER PLANTS

Frankfurt/Main FRANKFURTER ALLGEMEINE in German 23 April 82 p 3

[Article: "Moratorium on Construction of Nuclear Power Plants Rejected. SPD Congress Resolution. No Approval for Government's Energy Policy. Success for Ehmke"]

[Text] The rejection of a moratorium on the construction of new nuclear power plants by the SPD congress at Munich does not mean that the SPD supports the Federal Government's energy policy. While the government in its energy programs favors the increased use of nuclear power to cover basic needs for production of electrical current (i.e. in continually on-line power plants assuring basic output), the SPD feels it is important that even in the future, the basic question of a decision for or against the long range use of nuclear power should remain open. The Munich party congress did confirm the older party congress resolutions, according to which nuclear energy should be used only to cover a deficit that could not be met by the use of coal-fired plants.

The party executive had proposed in its resolutions that additional nuclear power plants could be built "only in terms of need." Such a formulation would have left the Federal Government with more latitude, because the need will also be determined by the cost differential between nuclear and coal-fired production, where nuclear power has the edge. Now, however, the party congress has resolved that new nuclear power plants can only be built "in accordance with existing party congress resolutions." The earlier resolutions allowed the construction of new nuclear plants only if the need for electrical current could be covered in no other way. The SPD has thus left Schmidt no greater latitude in his energy policy. Eppler pointed out at the party congress that under the previous resolutions no nuclear power plants could be allowed because the demand for current had not increased and there were already redundant power production capacities.

During the debates at the party congress, Hesse's Minister-President Boerner and the chairman of the miners union, Schmidt, spoke out for the Federal Government's energy policy and for the cautious expansion of nuclear energy. Boerner pointed out that because of protracted legal processes over the next two years there would be little likelihood of construction of new nuclear power plants being begun. If the party congress wanted to vote in favor of a moratorium they would only be making the SPD's task of governing in Hesse the harder.

Trade union leader Schmidt warned against a moratorium by pointing out, among other things, that the SPD would, by taking such action, be cutting back on the alliance between the party and the German Trade Union Federation "slice by slice." A 2-year moratorium would only bring the SPD "grief and loss of confidence" and create insecurity in the country. Workers in the coal and steel areas also needed the stimulus to employment that would follow from a reasonable energy policy. In the Ruhr and in the Saar there were already problems enough, said the union chairman. The SPD ought not to commit itself to an "either/or" policy but to "one as well as the other," that is, to an integration of coal and nuclear energy. Priority in energy production should go to domestic coal. If there were redundant capacities, then limits should be set on the use of oil, gas and imported coal. Coal would not suffer from a cautious expansion of nuclear power, said Schmidt, who also urged the construction of the high-temperature reactor, through which the use of coal could be made environmentally more compatible. Schmidt received the largest round of applause from the delegates. From this approval and in the course of the voting it became clear that Chancellor Schmidt's energy policy was favored primarily by the delegates from North Rhine-Westphalia and the trade unions.

Opponents of an expansion of nuclear energy were, in particular Matthiesen from Schleswig-Holstein, and Eppler. Eppler was in favor of the moratorium because it would bring a compromise beteen the various views held within the party and would leave a definitive decision open. Eppler remarked that it was the goal of the electrical power industry "to stage down the base load range of coal-fired power plants to an interim load stage" through the construction of nuclear power plants. The SPD had taken the position that nuclear power plants could only be built when demands could no longer be met by coal-generated current. It would be contradictory to want to build nuclear power plants if these, under certain circumstances, could not be tied into the power grid.

The line of the petitions committee, to which Eppler assented, did not succeed in the balloting. A motion of Matthiesen was defeated, which aimed at a prohibition on the construction of nuclear power plants until 1990. Another motion calling for funds to be made available for the development of alternative power sources on the same scale as those for nuclear energy, was voted down by only a small majority. A motion made by deputy floor leader Ehmke to table the moratorium proposal found a sufficient though small majority. Ehmke expressed the view that the question of whether nuclear energy ought to be used in the more distant future in the Federal Republic was not yet ripe for a decision.

9878
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HAMM HIGH-TEMPERATURE REACTOR BESET BY FINANCING PROBLEMS

Hamburg DER SPIEGEL in German 4 Apr 82 pp 50, 53

[Text] FRG reactor construction is ruining state finances. The costs of the high-temperature reactor in Hamm are reaching breeder dimensions.

The contract was so modestly drafted that it could have been drawn up by Franciscan monks.

The contract partners, the High-Temperature Nuclear Power Plant Co (HKG) and the Manufacturers Consortium, committed themselves to building the 300 megawatt [MW] thorium high-temperature reactor (THTR 300) "within the framework of cautious fiscal management as economically as possible according to the principles of technical-economic, reasonable operation."

The plant in Westfalian Hamm-Schmehausen was to be completed smoothly, within 5 years. And the cost of DM690 million sounded favorable, like a special offer.

When today, after a good decade of construction time, Klaus Knizia, president of the third-largest FRG power producer, United Electricity Works Westfalia Ltd (VEW) and HKG business manager, comes to speak of the costs of the new reactor type, the balance sheet looks neither economic nor reasonable.

For the most recent data, which Knizia's managers have now calculated internally, could introduce a third big financing scandal about a gigantic construction project in North Rhine-Westfalia, comparable to the cost debacle of the large clinical complex in Aachen which is to cost DM2 billion instead of DM550 million, and the fast breeder in Kalkar for which DM5.9 billion are now estimated (DM1.7 billion during planning).

According to statements by the operators, the reactor in Hamm will "in no way" be completed "before October 1985," instead of in 5 years, thus, at the earliest in almost 14 years. And, "as viewed today" the "current total costs" are six time as high as originally planned: DM4.22 billion. Whether this amount then will actually be enough, "naturally cannot be predicted with full accuracy."

Everything about it had seemed to be so problem-free when the 15-MW prototype was put into operation in 1966 in the Juelich nuclear research plant. The Ministry for Research in Bonn and the Land North Rhine-Westfalia quickly agreed to jointly finance the construction of a 300-MW THTR.

For Reimut Jochimsen, minister of economics in North Rhine-Westfalia, the "concentrated power plant" on the eastern edge of the coal region today still seems to be the "ideal model" for solving North Rhine-Westfalia's economic problems--"the great opportunity to make optimal use of our coal resources with the help of nuclear energy."

Performance and safety of the new reactor type had impressed Jochimsen from the very beginning. While light water reactors, thus all nuclear power plants currently in operation in the FRG except for Juelich and Karlsruhe, can heat their automatic water return as high as 350°C, in the case of the THTR the inert gas helium instead of water is heated up to almost 1000°C by the nuclear chain reaction.

Thus, the high-temperature reactor can be used not only to generate electricity, but also to supply process heat as in the case of coal transformation, or to supply long-distance heat.

And the THTR is also supposed to be safer than other nuclear power plants. While in the case of the light water reactor the worst conceivable accident could result in the melting of the reactor core and in the worst damage to the environment, with the reactor in Hamm melting of a multiply-encased, tennis-ball shaped fuel element of uranium and thorium is hardly possible according to the operators' representation. The radiation load from the reactor is no greater at the fence of the power plant of a THTR than that from a television set--1 millirem per year, a fraction of that which accumulates in the way of a radiation load in a concrete house.

The operators do not know how to explain why the "safe and problem-free plant" (HKG) has not yet been completed. For 6 years completion of construction has been predicted, always with a constant schedule: 3 and one-half years prior to starting operation. Since 1976 the nuclear managers had presented a higher final cost six times; in January of this year DM2.76 billion. If the rates of increase are extrapolated to 1985 there would be a total of nearly DM8 billion.

The fact that success with the long overdue building eludes the construction sponsor, the manufacturers, two participating Federal and three Land ministries is attributed by conglomerate managers to the size of the power plant which apparently overtaxes the parties involved.*

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*The following are involved in the THTR 300: As construction sponsor the High-Temperature Nuclear Power Plant Ltd (partners: Weser Community Power Plant Ltd, Veltheim; Hattingen Community Plant Ltd, Hattingen; Mark Municipal Electricity Plant Co, Hagen; Aachen City Works Co, Aachen: Bremen City Works Co, Bremen; United Electricity Works Westfalia Co, Dortmund); as the manufacturers consortium these companies: High-Temperature Reactor Construction Ltd

A high ministerial official in the Bonn Ministry for Research confesses that "in view of the 50 partial permits so far none of us sees his way completely clear." In this connection, about 60 TUeV [Technical Control Board] certificates and 10 partial permits are still outstanding. Six lawsuits are in progress, there can be others.

Of 1,400 conditions which were demanded by the Land government with the partial permits issued to date, the builders have satisfied only 500; the rest "is work for years" (according to an engineer at the construction site). Several hundred conditions have "proved to be so abstruse," say a managing staff worker of the manufacturers consortium, "that we simply cannot meet them." With new partial permits 500 additional conditions are pending.

HKG manager Knizia explained what is actually slowing things down: just for the construction of pipelines in the reactor hall 38,000 production plans and 88,000 individual documents were required which were covered with 397,000 signatures and 770,000 stamps. The test documents for 1,700 holding device designs fill 7,000 files. The documentation with the TUeV papers alone for the steam circuit covers 190,000 pieces of paper and weighs 41.2 tons.

Supply companies tried to exploit the gigantic paper floor for increasingly higher price demands. Because "the basic business conditions no longer exist" they cancelled the originally agreed upon fixed prices and since then have been insisting on payment according to time--a bottomless pit and uncontrollable. The money demands of the companies almost drove the HKG into bankruptcy last year: for months the power producers were unable to pay. Yet that need not have concerned the reactor operators very much: additional costs and losses are borne almost entirely by the state. Per contractual agreement, the Federal and Land Governments took over the

--"research and development pertaining to construction" during the construction period and the demonstration operation up to 100 percent, follow-up development costs from 70 to 90 percent;

--investment subsidies amounting to 66.7 percent (because the THTR is a demonstration plant), in addition 7.5 percent supplementary investment allowance.

Almost a trick not always to get the government to pay for it. Moreover, the six associates of HKG had succeeded before in doing this: according to the contract they contributed a total of only DM600 million in the way of self-financing of the THTR in Hamm--with the argument, expressly approved by

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[*] in Mannheim, Brown, Boveri and Co in Mannheim, Nukem Ltd in Hanau; as nuclear law supervisory authorities the North Rhine-Westfalian minister for labor, health and social affairs and the Federal minister of the interior; as the licensing authority the North Rhine-Westfalian minister of labor and the North Rhine-Westfalian minister for economics; as financiers the Federal minister for research and the North Rhine-Westfalian ministers for econmics and finance.

the Federal minister for research, in the construction of a comparable light water reactor they would get by with DM600 million; for innovations beyond that the state is responsible.

If possible the HKG will pay only DM50 million of the DM600 million. For DM510 million of the DM600 million are foreign funds which the state guarantees, without the electricity plants having declared themselves prepared to assume responsibility for this amount vis-a-vis the state. The rest of the DM90 million is its own capital, of which the HKG needs to pay only DM40 million if the test runs of the finished plant are successfully concluded.

The operators are even better off if there are no test runs at all. Then the risk-participation contract takes effect which the HKG concluded with the Federal minister for research and the North Rhine-Westfalian minister for finance. Key point in the 1971 agreement: the national government and the Land North Rhine-Westfalia will by and large assume any losses in operation as well as in shutting down the THTR 300.

Things could come to that point. For whether the THTR 300 will ever produce electricity in a way that covers costs is disputed among the experts. German industrial chemistry for which the project is supposed to be of special use thus far has appeared cool.

HKG boss knizia for the moment at least is allowing no doubts. He speaks of the 450-MW high-temperature reactor which is supposed to be far more usable than the THTR 300.

In March Knizia let North Rhine-Westfalia Minister of Economics Jochimsen know that the 450 will not exist until the THTR in Schmehausen has run for 2 years.

The sign is clear: The state is to continue paying.

12124
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FRANCE

REORGANIZATION OF ATOMIC ENERGY COMMISSION ANNOUNCED

Paris LE MONDE in French 20 Apr 82 p 11

[Article by Jean-Francois Augereau: "The Atomic Energy Commission Is Going to Be Reorganized"]

[Text] The Atomic Energy Commission (CEA) is to be reorganized soon. The organism's top administration has indeed been working for some time on a proposal for new structures which, after being submitted to the ministries concerned--Industry, Scientific Research and Technology, Defense--and to the tel Matignon, will shortly be presented to the trade-union organizations. The proposed reorganization will then, after possible amendments, be submitted to the Atomic Energy Committee, by 13 May at the earliest, or 10 June.

In order to understand what the proposed modifications of the CEA's structures and plan of organization are in the present state of thinking, which is not definitive, one must refer them to the situation as it was at the end of 1970, after the Giraud reform was instituted. To make an extreme simplification of matters, it appeared that the general administrator was surrounded by a general staff of 10 persons, including 7 deputies responsible for seeing to it that the activity of the CEA's operational units corresponded well to the mission nuclear materials, industrial applications of nuclear energy, military applications, etc--for which each was responsible.

On this basis, each deputy therefore had to define a policy corresponding to the mission for which he was responsible and see that it was applied, with each operational unit being responsible for application of this policy as well as for for putting the corresponding means into action. In addition, the Commission's organization comprised a central administration and central services, responsible for the various administrative, financial and technical sectors, and the famous operational units, whose nuclear-studies centers are still privileged territories.

Twelve years later, the structure in place is, overall, the same. But some play has developed in certain cogs and drive belts, while various internal adjustments have brought some changes: such is the case with the post of deputy for nuclear materials, whose function has been somewhat modified by the fact of the creation of the Nuclear Materials General Company (COGEMA), a 100-percent subsidiary of the CEA; the same is the case with the mission of the deputy responsible for safety problems, with the setting-up of the Institute for Nuclear Protection and Safety (IPSN). But beyond that, it is the very existence of the deputies that appears to be brought into question by the proposed reform of the CEA. Some appear to think that the system is somewhat vitiated in this area, resulting in the deputies' being made a sort of "super-directors" with excessively hierarchical behavior vis-a-vis the operational units. These latter, though originally intended to operate on the credits of different divisions, actually soon found themselves under the thumb of a single man.

For this reason, the proposed reform therefore aims to eliminate the deputies and regroup the operational units into larger entities, with their own means and a certain financial autonomy, to be defined. These entities, formed in the image of the institutes already existing in the CEA--the IPSN and the Institute of Fundamental Research (IRF)--could be four in number: first of all, the IPSN and the IRF. The latter would become a true institute and would no longer be the simple "federation" that it is today. To them would be added the Directorate of Military Applications (DAM) and an institute responsible for the applications of research, and some do not rule out the possibility of its being broken up into subgroups for electronuclear applications, isotopic separation, metallurgy, medical activities, electronic components, innovation and industrial research, etc.

To this vertical structure, placed under the authority of the general administrator (and to which should be added--to be complete--the activities of the subsidiaries, which have great autonomy of action), there should be "grafted" a permanent structure making it possible, in a certain way, to ensure the coherence of the CEA group, with all the institutes and subsidiaries together. In this domain, there could be set up a general secretariat, a sort of general superintendent responsible for administration, a division of industrial strategy, a programs and planning division to ensure the evaluation function--which some consider was done after the fact, whereas the credits were given before the fact--a social-relations division and a division of international relations.

What it in fact involves is the setting-up of a simpler mechanism, a top administration with limited staff and more dynamic means of action, and perhaps also the encouragement of a certain decentralization, which some measures taken in 1980 did not totally succeed in bringing about, while at the same time making the best use of the formidable reservoir of scientific and technical knowledge and know-how that the Commission constitutes.

This reorganization will perhaps require, in addition to the structural reforms, a minimum infusion of new blood. Should one view the rumors that suggest that Gerard Renon, presently technical adviser to Francois Mitterrand, could become assistant general administrator of the CEA, working with Michel Pecqueur, as a first sign in this direction?

Nearly 30,000 Persons

The CEA group taken as a whole--that is, including all subsidiaries--comprises nearly 30,000 persons. Of this total, a little more than 18,000 belong to the

Commission as such, and about half of these are employed by the Directorate of Military Applications (DAM). One could say, in a schematic way, that the CEA group is composed of three branches with staffs nearly equal in number: the subsidiaries, with almost 10,000 persons, including 8,600 in the COGEMA and nearly 1,000 in the CISI [expansion unknown], a data-processing services company; the DAM; and the rest.

The resources, not including those for the activities particular to the subsidiaries--essentially the COGEMA and the CISI--presently total a little more than Fr 13 billion, half of which is provided by credits from the Ministry of Defense. The balance is composed of Fr 5.26 billion in subsidies for the other programs and Fr 1.6 billion in the CEA's own receipts, one-third of which--about Fr 500 million--comes from the innovation and industrial-development sector, and a considerable proportion--Fr 240 million--from the electronuclear sector.

11267
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BRIEFS

ANTI-NUCLEAR MARCH, CAMP-IN--The arrival in Paris of the participants in the march against the Super-Phenix breeder reactor, who had set out from Creys-Malville (Isere) 3 weeks ago, was met with almost total indifference. On Saturday evening they attempted to be received at the Elysee, where they were advised to address themselves to the Ministry of Energy. There was disappointment, in Place de la Nation on Saturday afternoon, for the 20 antinuclear militants at the conclusion of their march against Super-Phenix. For 3 weeks they traversed France, at the rate of 25 km per day, meeting only with indifference from the population, or at best, sympathetic curiosity. In Paris, though, several hundred persons joined with them, including several young people who had at it with the photographers and with Brice Lalonde. In the demonstrators' view, one of the reasons for this setback is lack of information: "The people are not informed," explained one of the marchers; "some believe that Super-Phenix is already in operation." At each way-point, the local collectives organized information meetings "against the plutonium society." The marchers, who were always welcomed into local residents' homes, also met with local elected officials. "These officials," the antinuclear people consider, "have voted without understanding anything, and their votes have legitimized the behavior of EDF [French Electric Power Company]." While the antinuclear people are perfectly aware of the fact that their movement is a fringe one, and of the violence of their toughest elements, they consider that the march has at least made it possible to revive interest among local ecologist groups and to prepare for better coordination of the movement. On the left and on the right, nuclear power represents the same danger in their eyes, even if since 10 May an increasingly broad segment of public opinion seems to accomodate itself to it. In this area, they consider that the Socialists have betrayed their promises. That is why a delegation of militants went to the gates of the Elysee on Saturday evening, determined to camp there if necessary until Francois Mitterrand's return from Japan. [Text] Paris LE MATIN in French 19 Apr 82 p 16] 11267

NO NUCLEAR POWER PLANT FOR BRITTANY--No nuclear power plant for Brittany--at least not between now and 1986. This is what the minister of energy, Edmond Herve, reaffirmed to the Socialist militants of Morbihan. On the other hand, the region will be given a coal-fired thermal power plant, and the 400,000-volt high-tension power line planned between Nantes and La Martyre (Finistere) will not be given up. While the regional council, by the vote of its chairman, Raymond Marcellin, recently refused to engage in a debate on energy in the absence of the nuclear project, Edmond Herve stressed that "Brittany is not on the list of nuclear sites for 1986, and that is definitive." On the other hand, it will be equipped with one of the three coal-fired thermal power plants provided for in the government's energy program for the interim-plan period. The minister, after repeating the government's desire to diversify resources, stated that Brittany was to be oriented mainly toward micro-power plants. "It is the local collectivities that must check out the sites in function of the problems that this can entail," Edmond Herve indicated; he then repeated that the proportion for renewable energy sources--presently 2 percent of production--should be raised to 14 percent in 1990. Anothr problem taken up in the course of this meeting with the Socialists of Morbihan was the Nantes-La Martyre high-voltage line, which disturbs farmers and ecologists. This "electric-power freeway" will be built. Edmond Herve specified, however, that he has "ordered that information and consultations continue and that the population be addressed in clear language." [Text] [Paris LE MATIN 19 Apr 82 p 16] 11267

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ENVIRONMENTALISTS PROTEST RESEARCH POWER PLANT IN TUSCANY

Rome LA REPUBBLICA in Italian 6 Apr 82 p 35

[Article by Francesco Canosa: "Alarm in Tuscany, 'The PEC (Fuel Element Testing) Can Kill'"]

[Text] Florence, 5 April--Construction work on PEC should be suspended immediately. This is the drastic message of a press conference held in Florence by the regional secretaries of the Environmental League of ARCI [Italian Cultural Recreational Association] for Emilia Romagna (Emilio Lonardo) and Tuscany (Riccardo Basosi); the president of the Tuscan League, Enzo Tiezzi; and Arturo Pasquinelli and Massimo Nutini, assessor and president, respectively, of the Environmental Commission of the Commune of Vernio.

PEC stands accused, but so does the CNEN [National Nuclear Energy Commission], which is insisting that PEC be built despite the dissenting opinion of many scientists and the protests of several communes on the Tuscan slope of the Tuscan-Emilian Appennines. PEC is a plant for research on the fuel elements of fast reactors; it is experimental; and it is the only plant in Italy that would use both uranium and plutonium. But it has more than a few defects (according to its opponents), which can be summarized under three headings: health hazards, economic inefficiency, and the uselessness of our country's producing nuclear energy.

The first reason for asking that construction work be suspended is the fact that the site is clearly in an area subject to earthquakes. Between July 1981 and the present, more than 50 grade 5 eqrthquakes have been recorded with their epicenter in the high valley of the Bisenzio, between Vernio and the Brasimone (in Emilia, where PEC is being built). "Everyone knew about this in 1960," Nutini claims, "becuase it was established in a study made by geologists for the Ministry of Industry. The report ended up in some drawer at the Ministry; now the Magistrate of Porretta Terme has asked AGIP National Italian Oil Company to get it out."

Furthermore the CNR National Research Council, in proposing a new classification system for Italian seismic zones, saw fit to include the communes of the Tuscan side of the Appenines but not the Emilian side; it asked for new verifications for the Emilian side, "as though there could be a hump in the propagation of seismic waves," said Pasquinelli.

Besides the health hazards involved, there are economic and financial reasons for not proceeding with the construction of PEC. "Meanwhile, the original cost of 250-300 billion lire has become 1,100 billion," says Basosi. "Four hundred billion have been spent so far; 700 more will be needed if everything goes well. Only 150-200 would be needed to dismantle it; this would represent a huge saving." According to Basosi, who is professor of chemistry and physics at the University of Siena, "There can be no doubting the fact that PEC will never become operational." One reason is that even if Italy has nuclear power plants, "Twenty years from now," says Tiezzi, director of the Chemistry Institute of the University of Siena, "there won't even be a gram of uranium in the world." And nuclear power is no longer a relatively cheap energy source. During the press conference it was pointed out that Giorgio Nebbis, professor of the technology of marketable goods at the University of Bari, has demonstrated beyond a shadow of a doubt that nuclear power is no longer cost efficient. According to Nebbia, "We have lost the illusion of the 1970's that it was possible to produce a kilowatt hour of nuclear power for 25-27 lire, as opposed to 25-30 lire for energy from coal and 45-55 from oil. Today, unfortunately, nuclear power costs 50 lire per kilowatt hour, as opposed to 47 for energy from coal and 74 for energy from fuel oil."

But can our country give up nuclear power with no qualms? According to Tiezzi, we need look no further than the national energy plans adopted first by Minister Pandolfi and then by Marcora, as well as the calculations submitted by the National Committee for Energy Choices, for an enlightening answer. "PEN's National Energy Plan calculations are clearly wrong," says Tiezzi, "and I can prove it. The Pandolfi plan predicted that energy consumption in 1990 would be 200 million tons of oil equivalents, including 10 million from nuclear power. The Marcora plan predicts energy consumption by 1990 will be 185 tons of oil equivalents--15 less than the Pandolfi plan, but still including nuclear power." Why? "Do you want to know who wants nuclear power regardless of the cost and health hazards?" says Tiezzi dramatically: "It's the people who don't want a gas pipeline from Russia."

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May 25, 1982